	Experiment title: 3D imaging of the ex vivo calf's femur articular cartilage extracellular matrix (ECM) at different dehydration time to study the progression of the Osteoarthritis disease.	**Experiment number**: LS-2478
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Shifts: 12	**Local contact(s)**: Alberto Mittone	*Received at ESRF:*

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Report:

Articular cartilage (AC) is an aneural and avascular tissue that covers the ends of articulating bones in diarthrodial joints, and its main functions are to distribute joint loading and to provide nearly frictionless movement of articulating bones. The mechanical properties of AC can be attributed to the complex structure of its extracellular matrix (ECM), mainly composed by collagen fibres, proteoglycans (PG) aggregates and interstitial water [1,2]. Three different zones in cartilage ECM are usually individuated: the deep (or radial), the middle (or isotropic) and the superficial (or tangential) zone, identified by predominant collagen fibrils orientation.

In AC, aging processes occur in older age with cellular senescence [3], frequently involved in osteoarthritic diseases. For an early diagnosis methods it is essential to understand the mechanisms involved in the ECM modifications taking place during AC degradation to identify the progression of the disease.

In this framework We collected the 3D imaging of the AC extracellular matrix (ECM) to provide microstructural information of length scale lower than 10 micron.

This study is very important for the clarification of the open debate about the role of the structure modifications of cartilage ECM for clinical applications.

We performed XPCT in free space propagation mode at incident energy of 30 keV using a pixel size of 3 microns. We measure about 12 articular cartilage samples from 10 month old calf's femurs, cut into pieces of about 20 mm x 6 mm x 10 mm including cartilage and bone. The samples differ by dehydration conditions chosen to simulate different degrees of Osteoarthritis. The samples was included in plastic containers filled with agar.

We report in figure1 a recostructed slice in the axial plane at the interface between the AC and bone in the early phase of dehydration. The black dots are compatible with the chondrocytes.

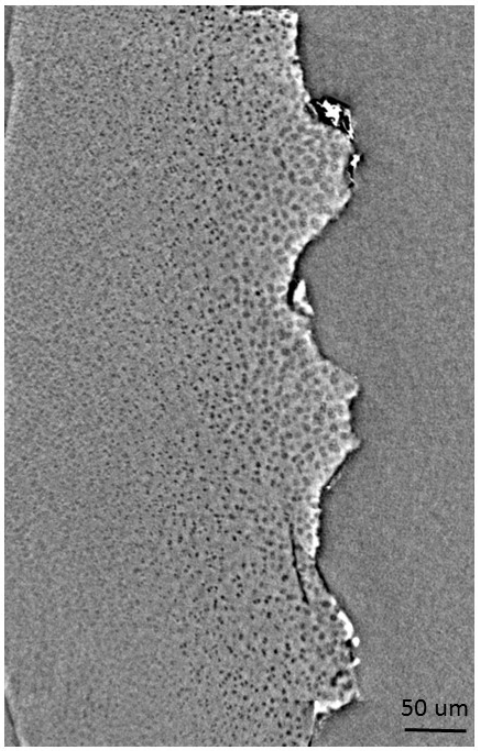

Figure 1: A recostructed slice at the interface between AC and bone. The black dots are compatible with the chondrocytes

[1] Zernia, G. 2006. Collagen dynamics in articular cartilage under osmotic pressure. NMR Biomed. 19:1010-1019.
[2]. Newman, A.P. 1998. Articular cartilage repair. Am. J. Sports. Med. 26:309-324
[3] R. F. Loeser. Aging and osteoarthritis. Curr. Op. Rheum.,(23), 492 (2011).